"IMPROVEMENTS IN OR RELATING TO A SAFETY ARRANGEMENT"

THE PRESENT INVENTION relates to a safety arrangement and more particularly relates to a safety arrangement provided in a motor vehicle adapted to lift the rear part of the hood or bonnet of the vehicle in response to an impact or accident situation involving a pedestrian.

It has been proposed to provide a safety arrangement adapted to raise the rear part of the hood or bonnet of the motor vehicle in the event that an accident should occur in which a pedestrian is involved. The reason for lifting the rear part of the hood or bonnet is that, with the rear part of the hood or bonnet lifted, the entire bonnet is spaced from the underlying engine. The hood or bonnet may thus deform, whilst decelerating the body or head of the pedestrian, thus giving the head or body of the pedestrian a relatively slow deceleration. If the hood or bonnet were not lifted, if the hood or bonnet deformed downwardly by even a short distance due to an impact with a pedestrian, that downward movement would soon terminate when the underside of the hood or bonnet impacted with the underlying engine, thus very rapidly decelerating the pedestrian with possibly fatal consequences.

Various proposals have been put forward as to mechanisms to achieve this objective, but it has been found difficult to provide a mechanism dimensioned to be located beneath the hood or bonnet, but which is capable of

providing a sufficient degree of lift. The present invention seeks to provide an improved safety arrangement.

According to one aspect of this invention there is provided a lifting unit for lifting the rear part of a hood or bonnet, the lifting unit comprising a hollow cylindrical guide and at least one piston moveable relative to the hollow cylindrical guide, the piston being of hollow cylindrical form.

Preferably the unit incorporates two pistons each moveable relative to the guide and each moveable relative to the other piston.

Advantageously both of said pistons are of hollow cylindrical form, the two pistons being telescopically inter-engaged, the innermost piston telescopically engaging the cylindrical guide.

Alternatively the unit incorporates one cylindrical piston moveable relative to the guide and one piston comprising a piston head and a piston rod moveable relative to the said cylindrical piston.

Preferably the piston rod is connected to the piston head by a yieldable coupling to enable the piston rod to be deflected from an initial axis of movement of the piston.

Alternatively the piston head is provided with a peripheral resilient sealing ring to facilitate deflection of the piston rod from an initial axis of movement of the piston rod.

In a further embodiment of the invention the lifting unit defines an inner guide cylinder and an outer cylindrical guide sleeve, a cylindrical piston being located between the inner guide cylinder and the outer guide sleeve.

Preferably an outer part of the inner guide sleeve defines a groove and an inner part of the cylindrical piston defines a groove, the grooves being co-aligned when the piston is an initial condition relative to the guide cylinder, there being a releasable element contained within the co-aligned grooves to retain the piston in the initial condition.

Conveniently the outer guide sleeve is provided with a re-entrant top portion configured to engage a piston head provided on the cylindrical piston.

According to another aspect of this invention there is provided a lifting unit for lifting part of a hood or bonnet, the lifting unit comprising a plurality of elements, at least one element being moveable relative to another element along a predetermined axis, the lifting unit being mounted or configured so that when the lifting unit is actuated at least part of the lifting unit may deviate from the said axis to facilitate the effecting of a virtual pivoting movement of the rear part of a hood or bonnet.

Preferably the entire lifting unit is mounted to be tilted from an initial position.

Conveniently the lifting unit is mounted with an abutment face present on the lifting unit engaging a resilient element mounted on a support, the resilient element being configured to be deformed to permit the tilting.

Advantageously the lifting unit comprise a plurality of elements, at least one element being moveable relative to another element along a predetermined axis, at least one part of the unit being yieldable to enable one element to be deflected from said axis on deployment of the lifting element.

Preferably the lifting element incorporates a piston having a piston head and a piston rod, the piston rod being connected to the piston head with a yieldable coupling so that the piston rod may become deflected from the axis of movement of the piston.

Conveniently the piston rod has a relatively narrow portion which passes through an aperture formed in part of the piston head, a resilient washer being trapped adjacent piston head by a flange provided on the piston rod.

In an alternative embodiment a piston is provided with a resilient sealing washer capable of deforming to permit one element of the lifting unit to become inclined.

Advantageously a piston is provided with a mounting lug provided with an aperture to receive a pivot pin.

In order that the invention may be more readily understood, and so that further features thereof may be appreciated, the invention will now be described, by way of example, with reference to the accompanying drawings in which:

FIGURE 1 is a perspective view of a lifting unit;

FIGURE 2 is a side view of the lifting unit of Figure 1;

FIGURE 3 is a plan view of a gas generator housing for use with the unit of Figure 2;

FIGURE 4 is a sectional view of the unit of Figure 2 and the associated gas generator housing in an initial position;

FIGURE 5 is a view generally corresponding to Figure 4, but taken from the opposite side, showing the unit of Figures 1 to 4 after deployment;

FIGURE 6 is an exploded view of some of the components of an alternative embodiment of the invention;

FIGURE 7 is a sectional view of the alternative embodiment of the invention prior to deployment;

FIGURE 8 is a view corresponding to Figure 7 illustrating the unit of Figures 6 following deployment;

FIGURE 9 is a sectional view of a further embodiment of the invention prior to deployment;

FIGURE 10 is a sectional view of the embodiment of Figure 8 following deployment;

FIGURE 11 is a view of yet another embodiment prior to deployment;

FIGURE 12 is a view corresponding to Figure 10 showing the embodiment of Figure 10 following deployment;

FIGURE 13 is a sectional view of another embodiment prior to deployment;

FIGURE 14 is a view of the embodiment of Figure 12 following deployment;

FIGURE 15 is an enlarged perspective view of components of the embodiment of Figures 13 and 14; and

FIGURE 16 is a side elevational and part sectional view of another embodiment of the invention.

Referring initially to Figures 1 to 5 of the accompanying drawings a lifting unit 1 is illustrated. The lifting unit includes an inner hollow cylindrical guide 2. The guide 2 is provided, at its lower end, with a projecting neck 3. The neck 3 is adapted to be inserted into a recess 4 contained within a housing 5. The housing 5 defines a second recess 6 adapted to receive a gas generator. The neck 3 is provided with a gas inlet aperture 7 so that the gas from the gas generator may flow into the interior of the cylindrical guide 2 that is associated with the neck 3.

The upper end of the cylindrical guide 2 is partially sealed by an upper cap 8. The upper cap 8 is provided with a central gas flow passage 9 there-through. The outer periphery of the upper cap 8 is provided with a groove 10 containing a sealing ring 11. The sealing ring engages the interior of

a first inner hollow moveable cylinder 12, the moveable cylinder 12 telescopically receiving almost the whole of the inner cylinder 2.

The first moveable cylinder 12 has its own upper cap 13 which defines a central gas flow passage 14 and which itself has an outer circumferential groove 15 which contains a sealing ring 16, the sealing ring 16 sealingly engaging the interior of a second hollow outer moveable cylinder 17. The upper cap 13 of the first moveable cylinder 12 has a depending circumferential skirt which closely embraces the upper part of the first moveable cylinder 12. The second moveable cylinder 17 telescopically receives the combination of the inner cylinder 2 and the first moveable cylinder 12. The second moveable cylinder 17 is provided with an end sealing cap 18, the end sealing cap 18 having a central projection 19.

The entire unit 1 is relatively compact and may readily be mounted in position beneath the rear part of the hood or bonnet of a motor vehicle.

It is to be understood that, should an accident arise involving an impact of the vehicle with a pedestrian, gas will be generated and will flow through the apertures 7 into the neck 3 and thus into the hollow interior of the cylindrical guide 2. It will be possible to achieve a substantial flow rate of gas, since the gas will not initially be fed into an extremely small chamber but instead will be fed into the entire hollow interior of the cylindrical guide 2. Gas will flow through the outlet port 9 provided in the sealing closure 8, and will cause the first moveable cylinder 12 and the outer moveable cylinder 17 to move axially, the cylinders being guided, one on the other and the first moveable cylinder 12 being guided on the fixed cylindrical guide 2. The entire combination of cylinders will expand telescopically to have a substantial length as shown in Figure 5.

It can be seen that because there are two moveable hollow cylinders 12 and 17 each of which has a length substantially equal to that of the inner cylindrical guide 2, a total "lift" can be achieved which is equal to approximately twice the initial height of the unit.

Once the cylinders have "lifted" to have the configuration as shown in Figure 5 there is a certain "play" between the interconnection of the adjacent cylinders enabling the uppermost tube 17 to tilt about the axis defined by the innermost guide cylinder 2. This may be of substantial benefit since the rear part of a hood or bonnet, when lifted by the lifting unit, will effect a virtual pivotal movement about the retaining catch provided at the front of the hood or bonnet.

Referring now to Figures 6 to 8, in an alternative embodiment of the invention a lifting unit 20 is provided with a housing 21 defining a chamber or cavity 22 to receive a gas generator. The housing 21 is provided with a peripheral mounting flange 23 and is also provided with an axially extending inner hollow guide cylinder 24. The inner guide cylinder 24 terminates with a closed end provided with a gas outlet aperture 24a. The portion of the inner guide cylinder 24 adjacent the chamber 22 containing the gas generator is thickened at 25 and the thickened portion 25 is provided with an outer peripheral semicircular groove 26.

A hollow cylindrical piston 27 is provided which surrounds the inner guide cylinder 24. One end of the piston 27, adjacent to the thickened portion 25 of the inner guide cylinder 24 is provided with a piston head 28. The piston head is of annular form and in an initial position surrounds the thickened portion 25 of the inner guide cylinder 24, and is provided with an internal

semicircular groove 29 which is in alignment with the semicircular groove 26 provided in the thickened portion 25. A "C" clip 30 is retained within the co-aligned grooves, thus holding the cylindrical piston 27 in a predetermined initial condition relative to the inner guide cylinder 24.

The upper end of the cylindrical piston 27 is sealed by means of a sealing plug 31. The sealing plug 31 may be configured to be biased against the underside of a hood or bonnet or may be configured to define a pivot axis, on which part of the hood or bonnet may be pivotally mounted.

The housing 21 carries an outer hollow cylindrical guide sleeve 32, the outer guide sleeve 32 extending upwardly from above the mounting flange 23 so as to telescopically receive the cylindrical piston 27 and the inner guide cylinder 24. The outer guide sleeve 32 is formed of a deformable material and has, at its upper end, an inwardly folded re-entrant portion 33 which contacts the outermost part of the upper region of the cylindrical piston 27. The piston head 28 of the cylindrical piston 27 is a sliding sealing fit within the outer guide sleeve 32.

On actuation of the gas generator the hollow cylindrical piston 27 moves upwardly, as gas flows through the hollow interior of the inner guide cylinder 24 and through the gas outlet aperture 25 into the interior of the cylindrical piston 27. As the piston 27 moves upwardly, the piston 27 becomes disengaged from the guide cylinder 24. As the piston head 28 is a sliding sealing fit within the guide sleeve 32, the continued generation of gas continues to force the piston 27 upwardly. The piston head 28 then engages the lower end of the re-entrant portion 33 of the guide sleeve 32. This re-entrant portion 33 is then deformed, thus absorbing energy and terminating the upward movement of the cylindrical piston 27. The unit 20 then has the condition shown in Figure 8.

Figures 9 and 10 illustrate another embodiment of the invention in which a lifting unit 40 comprises an outer cylindrical guide 41 of uniform cross-section with, at its upper end, an inwardly directed lip. The guide 41 is provided, at its base, with a housing 42, the housing 42 defining a chamber or cavity 43 to receive a gas generator, the gas generator being configured to direct gas into the interior of the guide 41. Contained within the guide 41 is a hollow cylindrical piston 44. The piston 44 is generally of uniform section, and is provided at its upper end with an inwardly directed lip. The piston 44 is provided with a piston head 45 adjacent to the housing 42, piston head 45 defining an outer peripheral groove 46 which receives a sealing ring 47, the sealing ring 47 effecting a substantially sealing sliding fit within the outer cylindrical guide 41.

Contained within the inner cylindrical piston 44 is a piston unit 48, the piston unit having a piston rod 49 carrying, at its lower end, a piston head 50. The piston head 50 is provided with a peripheral and inner groove 51 containing a sealing ring 52 which engages the interior of the cylindrical piston 44. The piston rod has a relatively narrow portion 53 above the lower terminal end of the piston rod. The narrow portion 53 extends through a corresponding aperture formed in a web constituting a central part of the piston head, and also through a resilient washer 54 above the web. The piston rod 49 has enlarged flange 55 which abuts the upper surface of the washer 54. Thus the washer 54 and the web of the piston head are trapped between the flange 55 and the end of the piston rod 49.

The uppermost end of the piston rod is engaged with an end cap 56 which initially covers the uppermost ends of the cylindrical guide 41 and cylindrical piston 44.

When gas is generated by a gas generator within the cavity 43 the piston head 50 of the piston unit 48 moves upwardly, until it engages the lip at the uppermost end of the cylindrical piston 44. The cylindrical piston 44 also moves upwardly until the piston head 45 on the cylindrical piston 44 engages the lip at the uppermost end of the outer guide 41. The lifting unit is then fully extended, as shown in Figure 9.

It is to be appreciated that the piston rod may be deflected slightly from its initial axis due to the presence of the resilient washer 54 between the flange 55 on the piston rod 49 and at the adjacent web forming part of the piston head 50. This may facilitate the opening of the rear part of the hood or bonnet since, when the rear part of the hood or bonnet is lifted, the rear part exhibits a virtual pivotal motion about the fastening catch provided at the front of the hood or bonnet.

Figures 11 and 12 illustrate an embodiment of the invention which is very similar to that described with reference to Figure 9 and 10, but in this embodiment the piston rod 49 is securely connected to the piston head 50. Other features of the embodiment of Figure 11 and 12 are the same as described above with reference to Figure 9 and 10. The operation of the unit is the same as that described with reference to Figure 9 and 10 but it is to be appreciated that when the conventional piston 48 is in the full extended position the piston rod 49 may tilt about an axis defined in the region of the piston head, due to a slight flexibility provided by the sealing ring 52. This again facilitates a virtual pivotal movement of the uppermost part of the piston.

Figures 13 and 14 illustrate a further embodiment of the invention. Figure 13 illustrates a lifting unit 60 in its initial condition. The lifting unit 60

incorporates a housing 61 defining a chamber 62 to receive a gas generator. The upper part of the housing 61 supports an inner hollow guide cylinder 63. The upper end of the guide cylinder 63 defines a gas outlet port 64. The base of the guide cylinder 63 is provided with a thickened region 65, adjacent the housing 61. An annular peripheral groove 66 is provided formed in the thickened region 65. The groove 66 contains a "C" clip 67.

A hollow cylindrical piston 68 is provided which is engaged telescopically with the guide cylinder 63. The lowermost end of the cylindrical piston 68 is provided with a piston head 69. The piston head 69 is provided with an inner annular groove 70 of a form corresponding to that of the annular groove 66 formed in the thickened base region 65 of the hollow inner cylindrical guide 63. Contained within the groove is a resilient annular ring 71.

The annular piston head 69 is also provided with a peripheral groove 72 provided in its radially outermost face, the peripheral groove 72 containing a sealing ring 73.

The upper end of the cylindrical piston 68 is provided with a plug 74. The plug 74 is provided, at its outer end, with an upstanding lug 75. The lug 75 defines a through-bore 76 dimensioned to receive a pivot pin. Part of the hood or bonnet may be pivotally mounted on the pivot pin.

The housing 61 carries a hollow cylindrical outer guide sleeve 77. The lowermost end of the guide sleeve 77 is crimped to the housing 61. The piston head 69 of the cylindrical piston 68 is a sliding sealing fit within the guide sleeve 77. The upper end of the guide sleeve 77 is crimped to a annular mounting ring 78. The mounting ring 78 may be used to mount the lifting unit 60 to an aperture formed in a support plate 79 forming part of the vehicle. A

wiper seal 80 may be provided at the upper end of the guide sleeve 77, adjacent the mounting ring 78, the wiper seal 80 engaging the outer surface of the cylindrical piston 68.

It is to be appreciated that the cylindrical piston 68 in an initial position, as shown in Figure 13, the combination of the "C" clip 67 and the annular ring 71 in the co-aligned annular grooves 66 in a thickened portion 65 at the base of the inner cylindrical guide 63 and 70 formed in the inner face of the piston head 69, serve to retain the cylindrical piston 68 firmly in an initial position. Thus the apertured lug 75 can provide a firm pivot point for the rear part of the hood or bonnet.

On actuation of the lifting unit, gas is supplied from the gas generator through the hollow cylindrical guide 63 to the interior of the cylindrical piston. The cylindrical piston 68 thus moves axially, lifting the lug 75.

When the cylindrical piston 68 has been lifted it is possible for the axis of the cylindrical piston 68 to deviate from the axis of the cylindrical guide 63 and also the cylindrical sleeve 77. This enables a hood or bonnet to effect a virtual pivoting motion about a front fastening catch.

Figure 16 illustrates a further embodiment of the invention in which a lifting unit 81 which may be a lifting unit having the same internal design as that of the lifting unit 60 is mounted in position so that the entire lifting unit may tilt or pivot from an initial vertical position. Lifting unit 81 is provided with an outer cylindrical guide 82, and carries, at its lower end, an outwardly directed mounting flange 83. Beneath the mounting flange 83 a housing 84 is provided to contain a gas generator.

The upper end of the lifting unit is provided with an apertured lug 85.

The flange 83 rests on top of an annular resilient ring 86 resting on a support 87 and is held in position by means of an annular retainer ring 88 which has an inwardly directed lip which extends inwardly over the flange 83. It is to be appreciated that the lifting unit 81 may effect a tilting or pivoting movement about an initial upright position, so that the unit deviates from its initial position with part of the resilient ring 86 beneath the flange 83 being consequently compressed. This again facilitates a virtual pivoting movement of the hood or bonnet being lifted by the lifting unit.

In the present specification "comprises" means "includes or consists of" and "comprising" means "including or consisting of".

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS:

1. A lifting unit for lifting the rear part of a hood or bonnet, the lifting unit comprising a hollow cylindrical guide and at least one piston moveable relative to the hollow cylindrical guide, the piston being of hollow cylindrical form.

2. A lifting unit according to Claim 1 wherein the unit incorporates two pistons each moveable relative to the guide and each moveable relative to the other piston.

3. A lifting unit according to Claim 2 wherein both of said pistons are of hollow cylindrical form, the two pistons being telescopically inter-engaged, the innermost piston telescopically engaging the cylindrical guide.

4. A lifting unit according to Claim 2 wherein the unit incorporates one cylindrical piston moveable relative to the guide and one piston comprising a piston head and a piston rod moveable relative to the said cylindrical piston.

5. A lifting unit according to Claim 4 wherein the piston rod is connected to the piston head by a yieldable coupling to enable the piston rod to be deflected from an initial axis of movement of the piston.

6. A lifting unit according to Claim 4 wherein the piston head is provided with a peripheral resilient sealing ring to facilitate deflection of the piston rod from an initial axis of movement of the piston rod.

7. A lifting unit according to Claim 2 wherein the lifting unit defines an inner guide cylinder and an outer cylindrical guide sleeve, a cylindrical piston being located between the inner guide cylinder and the outer guide sleeve.

8. A lifting unit according to Claim 7 wherein an outer part of the inner guide sleeve defines a groove and an inner part of the cylindrical piston defines a groove, the grooves being co-aligned when the piston is an initial condition relative to the guide cylinder, there being a releasable element contained within the co-aligned grooves to retain the piston in the initial condition.

9. A lifting unit according to Claim 7 or 8 wherein the outer guide sleeve is provided with a re-entrant top portion configured to engage a piston head provided on the cylindrical piston.

10. A lifting unit for lifting part of a hood or bonnet, the lifting unit comprising a plurality of elements, at least one element being moveable relative to another element along a predetermined axis, the lifting unit being mounted or configured so that when the lifting unit is actuated at least part of the lifting unit may deviate from the said axis to facilitate the effecting of a virtual pivoting movement of the rear part of a hood or bonnet.

11. A lifting unit according to Claim 10 wherein the entire lifting unit is mounted to be tilted from an initial position.

12. A lifting unit according to Claim 11 wherein the lifting unit is mounted with an abutment face present on the lifting unit engaging a resilient element mounted on a support, the resilient element being configured to be deformed to permit the tilting.

13. A lifting unit according to any one of Claims 10 to 12 wherein the lifting unit comprise a plurality of elements, at least one element being moveable relative to another element along a predetermined axis, at least one part of the unit being yieldable to enable one element to be deflected from said axis on deployment of the lifting element.

14. A lifting element according to any one of Claims 10 to 13 wherein the lifting element incorporates a piston having a piston head and a piston rod, the piston rod being connected to the piston head with a yieldable coupling so that the piston rod may become deflected from the axis of movement of the piston.

15. A lifting unit according Claim 14 wherein the piston rod has a relatively narrow portion which passes through an aperture formed in part of the piston head, a resilient washer being trapped adjacent piston head by a flange provided on the piston rod.

16. A lifting unit according Claim 14 wherein a piston is provided with a resilient sealing washer capable of deforming to permit one element of the lifting unit to become inclined.

17. A lifting unit according to any one of the preceding Claims wherein a piston is provided with a mounting lug provided with an aperture to receive a pivot pin.

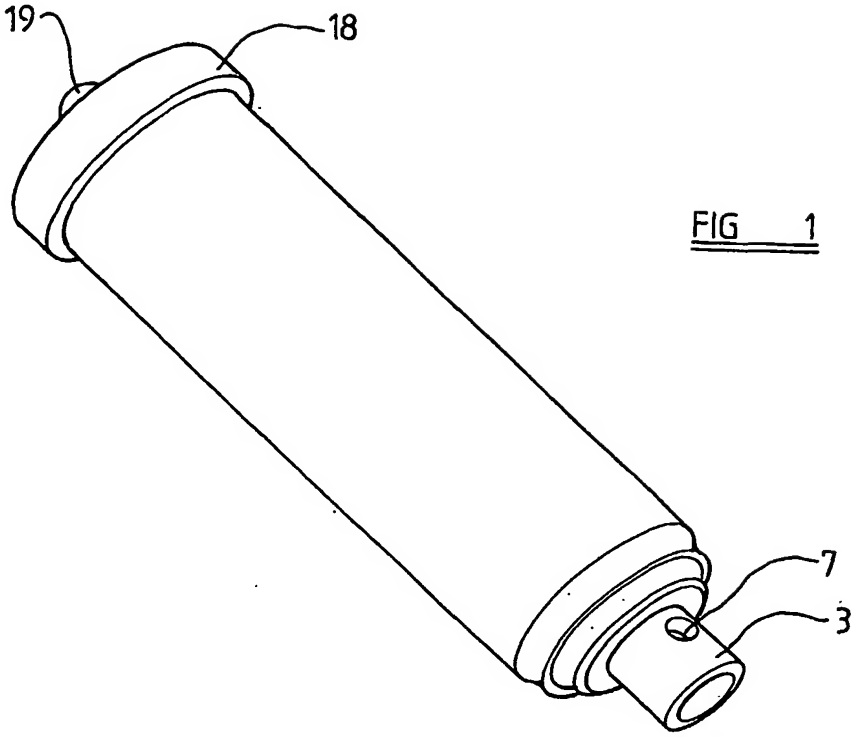


FIG 1

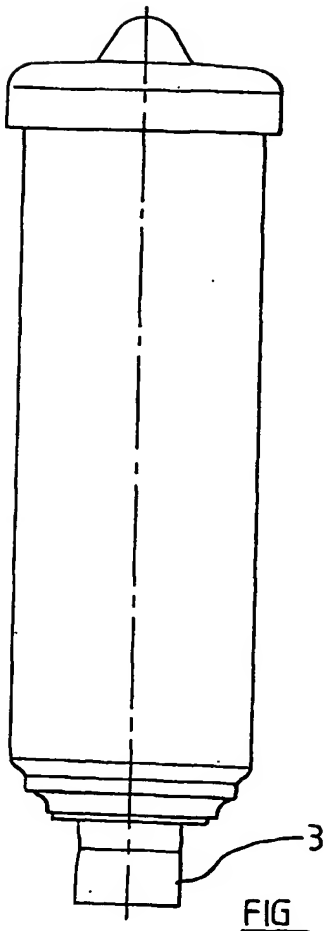


FIG 2

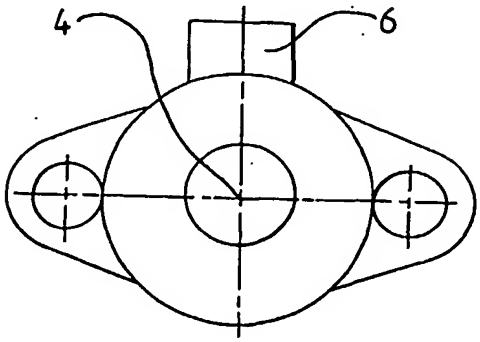


FIG 3

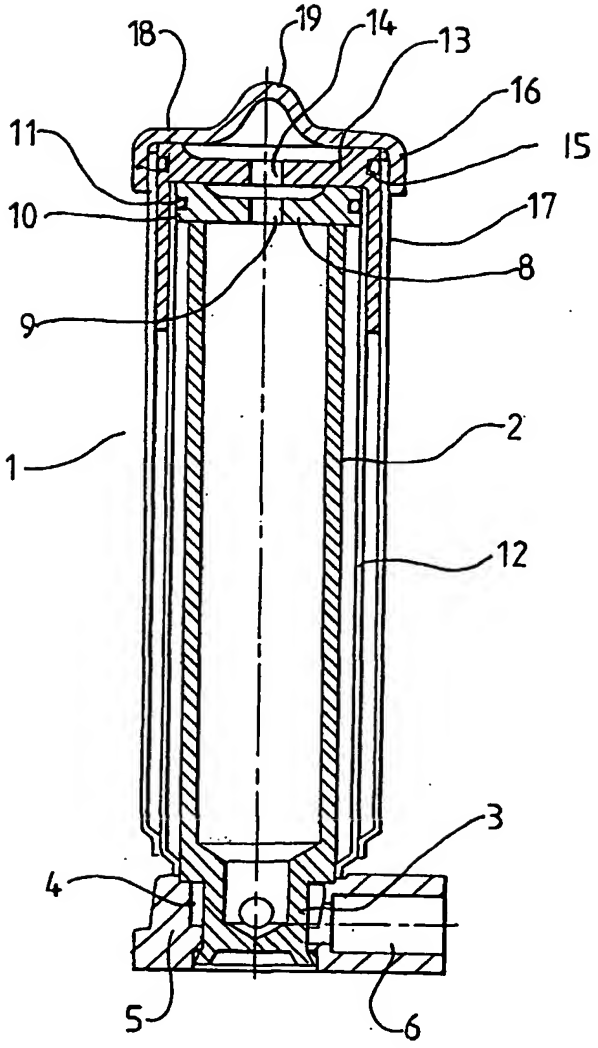


FIG 4

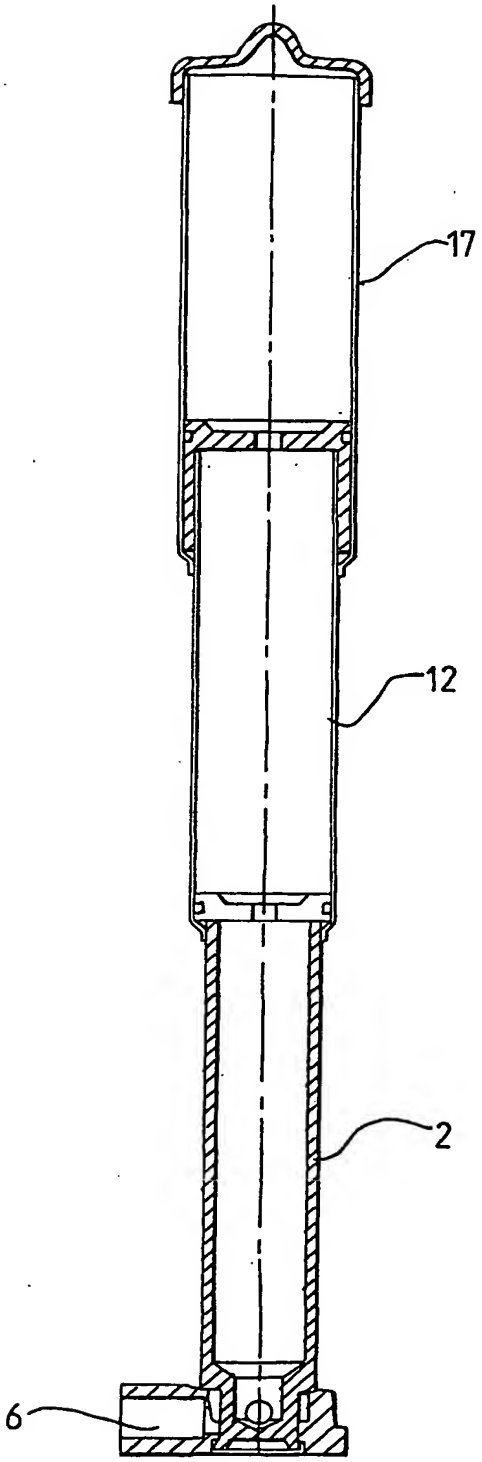


FIG 5

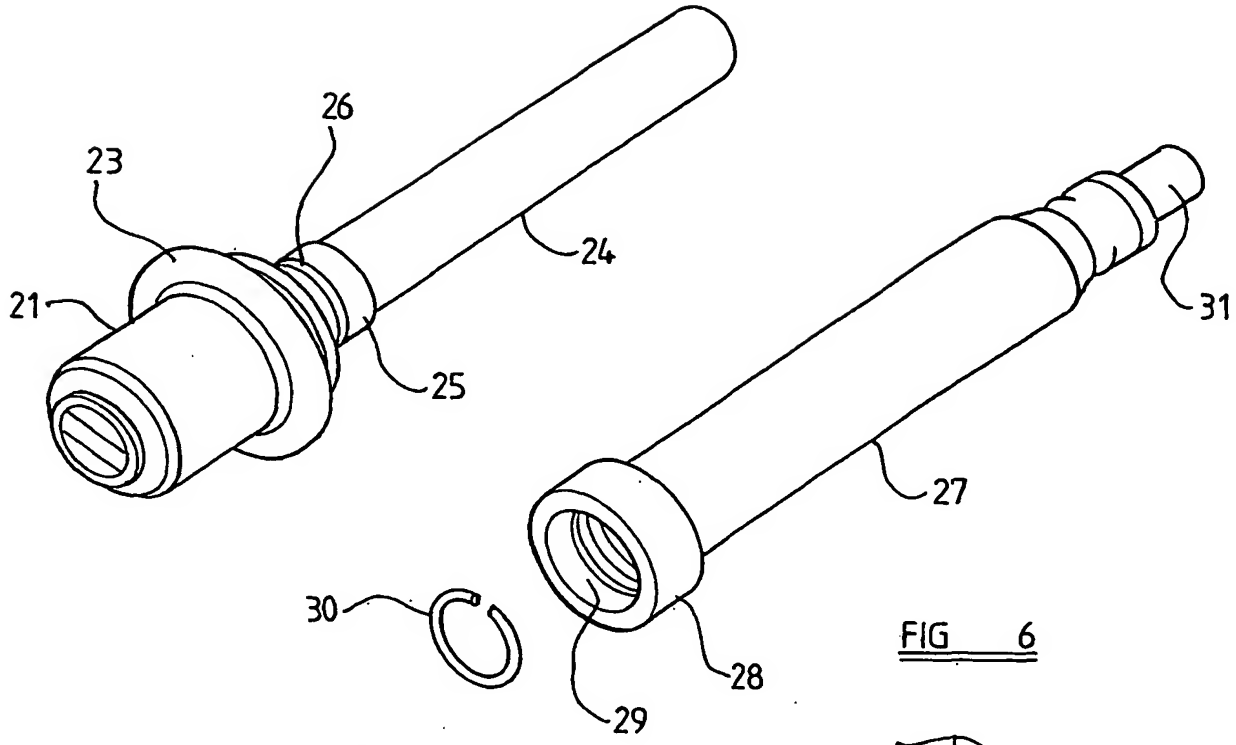
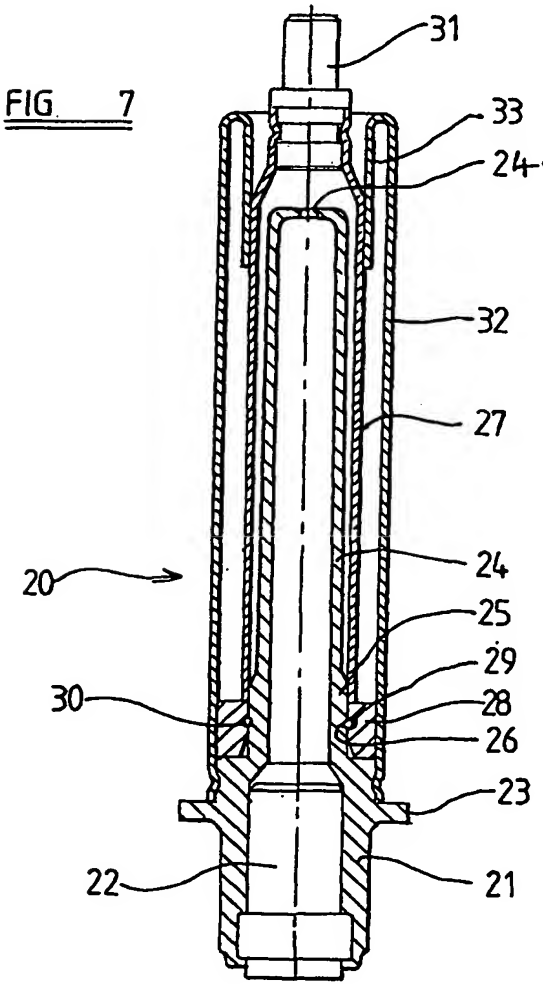


FIG 6

FIG 7



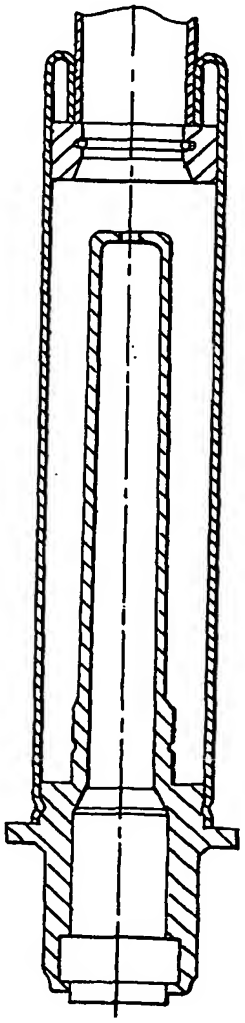


FIG 8

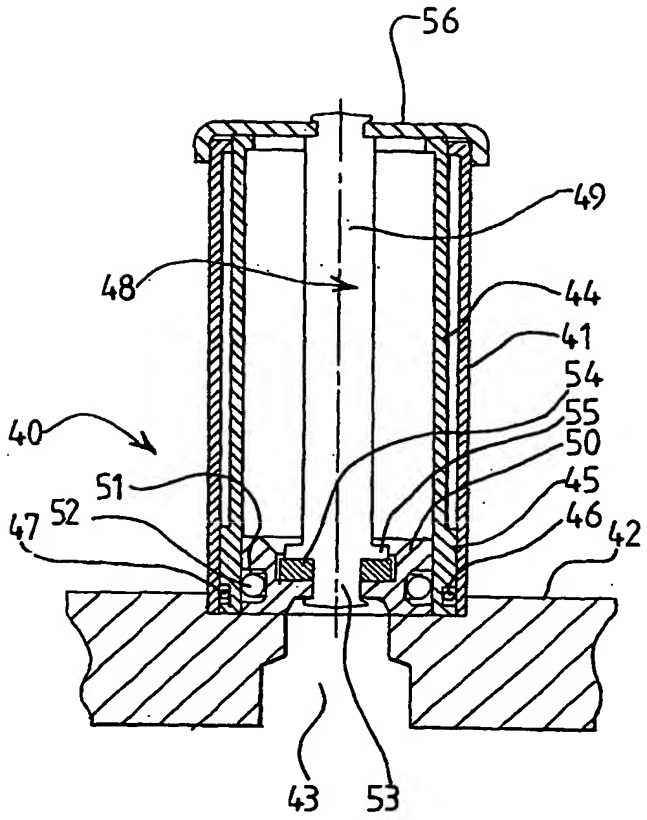

56
49
48
44
41
54
55
50
40
51
45
47
52
46
42
43
53

FIG 9

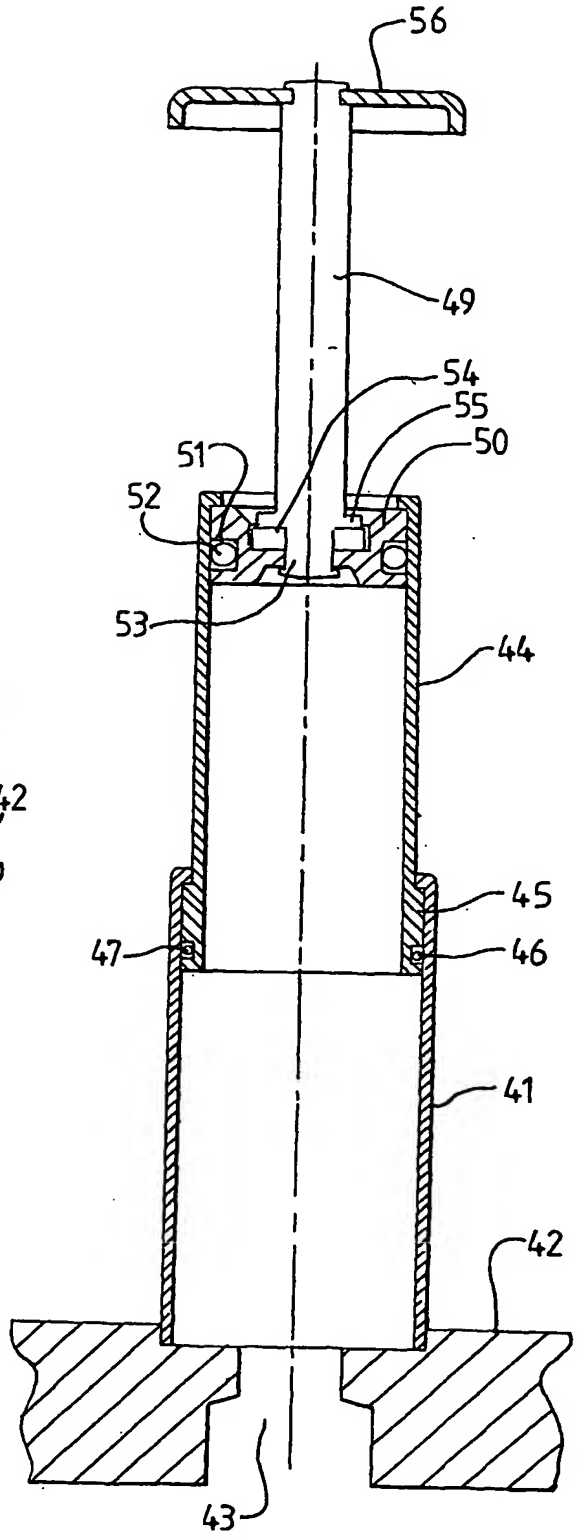

56
49
54
55
51
50
52
53
44
45
47
46
41
42
43

FIG 10

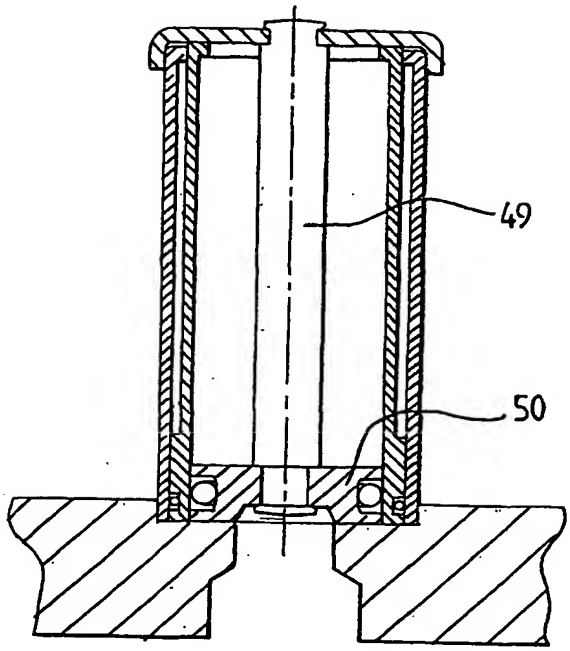


FIG 11

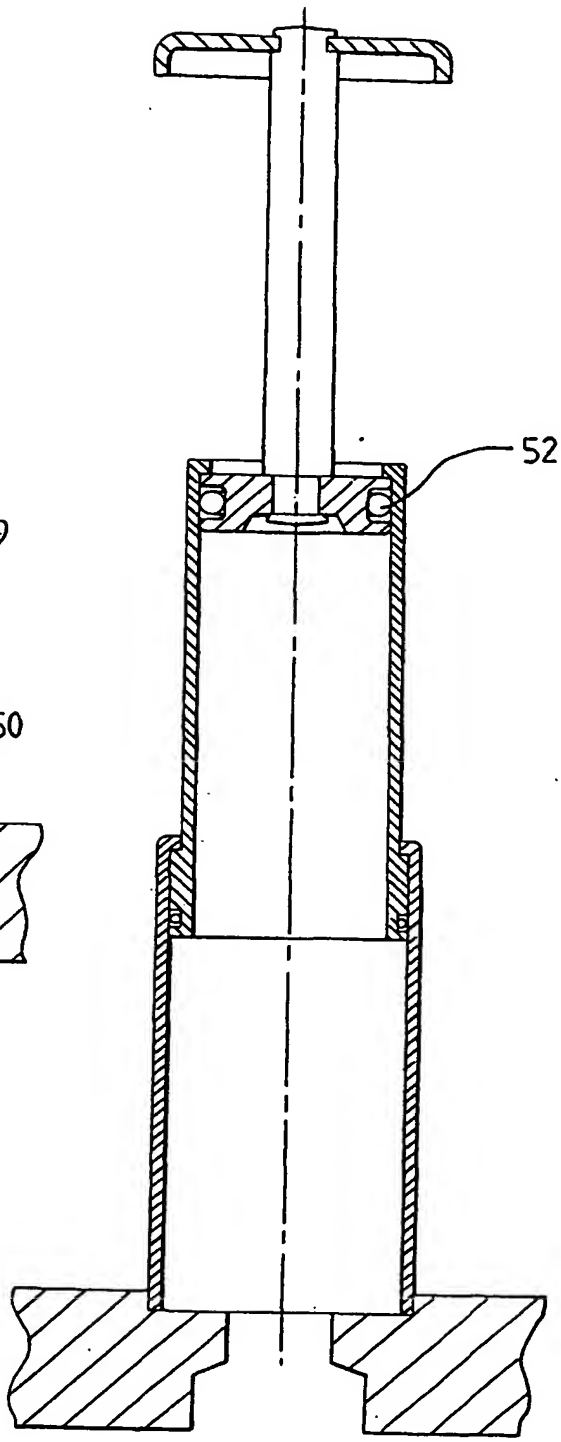


FIG 12

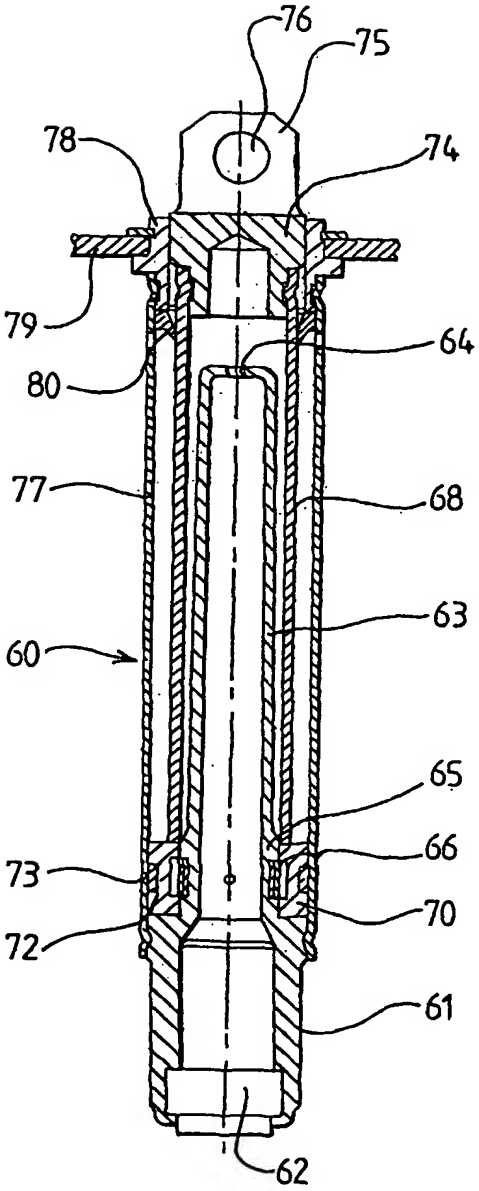

76
75
78
74
79
64
80
77
68
63
60
65
66
73
70
72
61
62

FIG 13

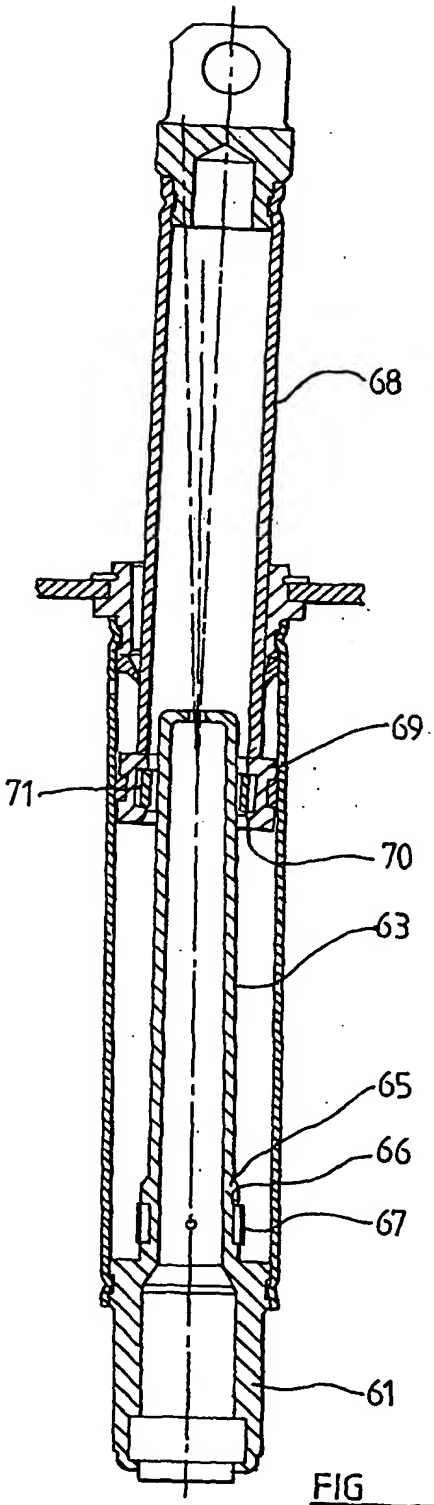

68
69
71
70
63
65
66
67
61

FIG 14

FIG 15

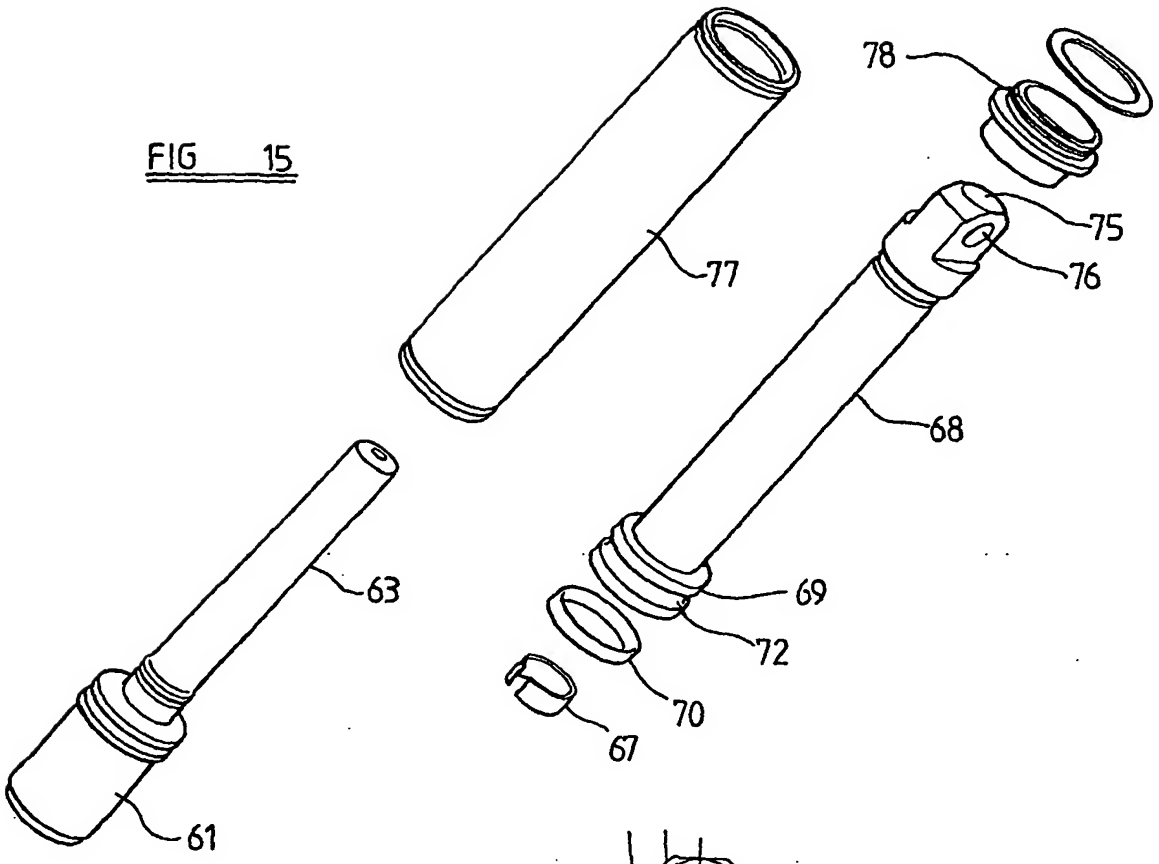
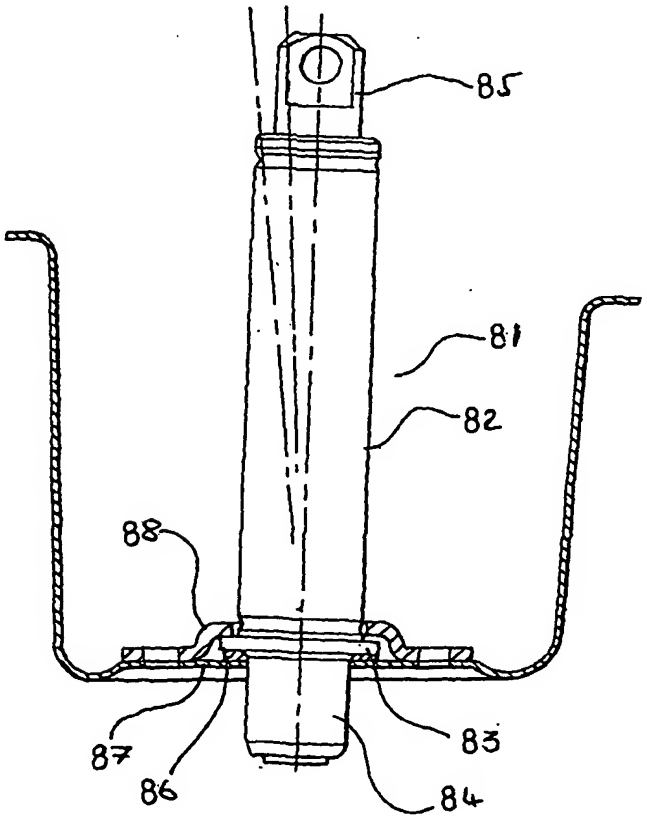


FIG 16



INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 2003/001823

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B60R 21/34
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B60R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 0209983 A2 (TR ENGINEERING GMBH), 7 February 2002 (07.02.2002), page 4, line 18 - line 28, figure 1 --	1,17
P,X	EP 1350693 A1 (DAIMLER CHRYSLER AG), 8 October 2003 (08.10.2003), paragraph [0028]-[0035], fig 2a-2c --	1-3
X	DE 2841315 A1 (VOLKSWAGENWERK AG), 10 April 1980 (10.04.1980), page 5, line 25 - line 28, figure 1 --	11,13,14,17
X	DE 10108882 A1 (VOLKSWAGEN AG), 5 Sept 2002 (05.09.2002), paragraph [0032]-[0035], fig 2 --	10,11,17

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 February 2004	17 -02- 2004
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Hans Nordström/EK Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 2003/001823

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 10116717 A1 (VOLKSWAGEN AG), 10 October 2002 (10.10.2002), figure 3, abstract -- --------	10,11;17

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 2003/001823

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Claims 1-9 and 17 relate to a lifting unit comprising a hollow cylindrical guide and a hollow cylindrical piston.

Claims 10-16 relate to a lifting unit comprising a part which may deviate from an axis.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3 ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

24/12/2003

International application No.
PCT/SE 2003/001823

WO	0209983	A2	07/02/2002	AU	8975301 A	13/02/2002
				DE	20013256 U	13/12/2001
				EP	1305193 A	02/05/2003
EP	1350693	A1	08/10/2003	DE	10214602 A	30/10/2003
				EP	1350694 A	08/10/2003
DE	2841315	A1	10/04/1980	NONE		
DE	10108882	A1	05/09/2002	NONE		
DE	10116717	A1	10/10/2002	NONE		